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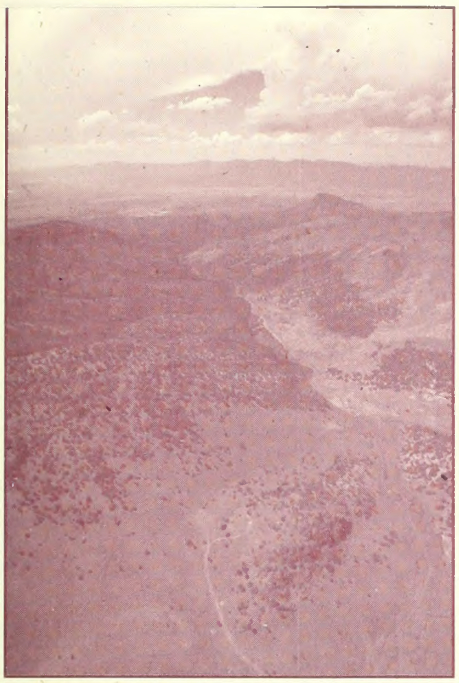

THE GREAT BASIN:

Healing the Land

BUREAU OF LAND MANAGEMENT

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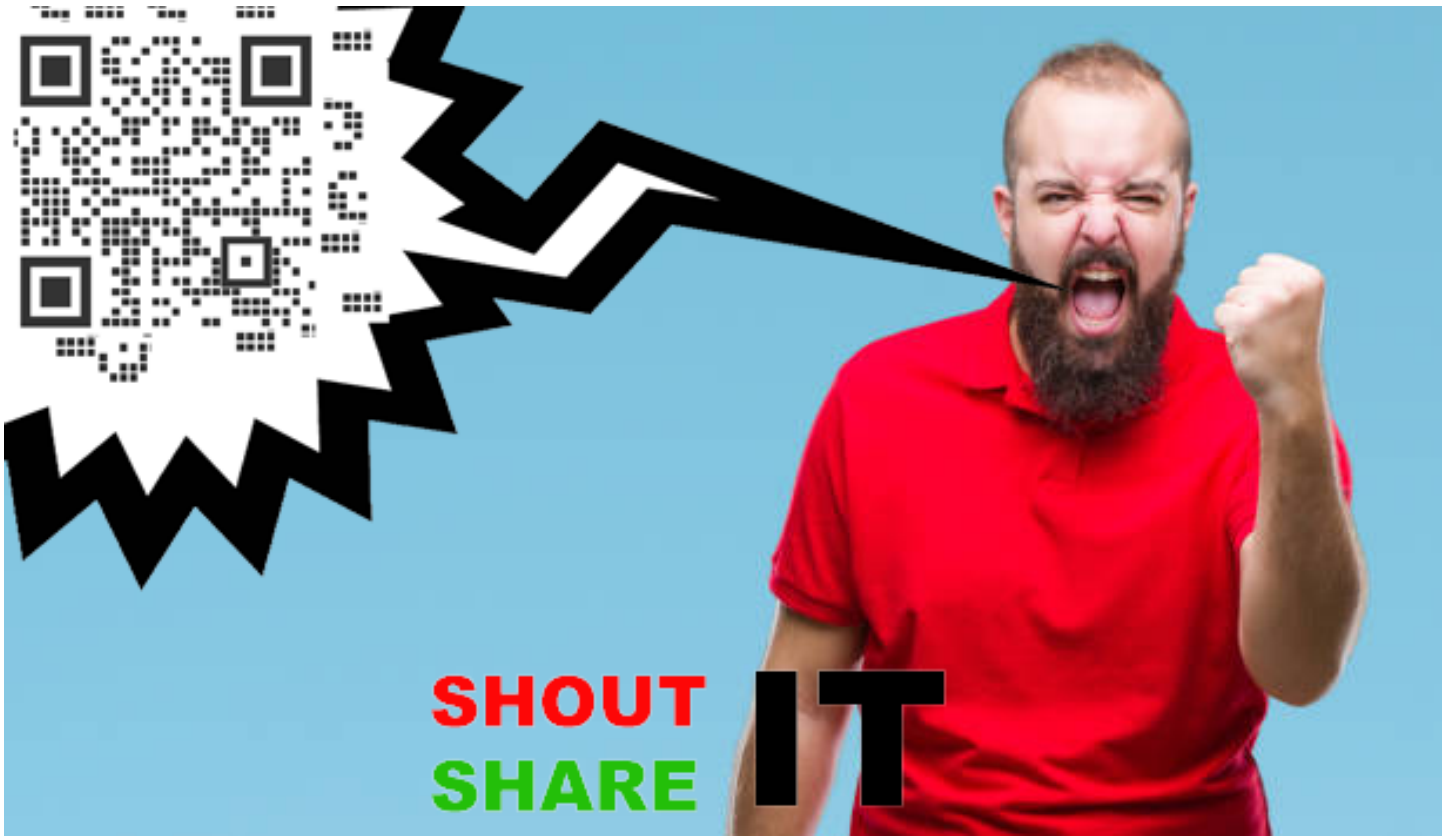
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Dear Reader:

By now, you probably know that public land in the Great Basin suffered through the worst fire season in perhaps four decades. More than 1.7 million acres burned, most of the damage coming in less than one week in early August, as lightning ignited dozens of fires.

Long before these devastating wildland fires, the health of the Great Basin was in jeopardy. Exotic annual grasses, primarily cheatgrass, have taken over upwards of 25 million acres of public land in the Great Basin, robbing this unique part of the country of much of its natural heritage. The events of last summer raise the specter of even more severe fire seasons in the future, as the explosive cycle of annual grasses and wildland fire repeats itself: the more fire, the more cheatgrass. And the more cheatgrass, the more fire.

Something must be done to stop the downward spiral of ecological conditions in the Great Basin. What we've done before – a combination of treatments primarily designed to stabilize soils after a wildland fire – has not reversed this trend.

Teams of specialists from BLM, and other state and federal agencies, have put together a proposal called "The Great Basin Restoration Initiative." In this, the second report issued by the specialists, the background and challenges of restoration are briefly reviewed, guiding principles for restoration are identified, and strategies are outlined to help the restoration work move forward.

I firmly support restoration. Seldom has BLM had the opportunity to assert itself as a land manager as we do now in restoring an ecological system to a more naturally functioning condition. The results will be fewer wildland fires of severe intensity, reduction in the spread of exotic annual grasses and noxious weeds, and ecosystems that are more stable, resistant and resilient to environmental fluctuations and disturbances. We are setting the groundwork to help the Great Basin become more adaptable to environmental disturbance.

It is an opportunity that we must take, in concert with local communities. The work must be directed from the resource area or field office level. Too much is on the line for us to attempt anything less than a comprehensive restoration effort.

After all, 75 million acres of public land in the Great Basin are at stake and the clock is ticking. The time for us to move forward is now.

Tom Fry

Acting BLM Director

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THE GREAT BASIN:

Healing the Land

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Executive Summary

The Great Basin is in trouble.

Forget the ruggedness of the land, the harshness of the environment. Don't be fooled by its solitary nature and extreme climate. Exotic annual grasses and noxious weeds, introduced during 150 years of settlement, combined with the devastating fire season of 1999 in which more than 1.7 million acres of public land burned, have left the area vulnerable. It is a place once described by writer Wallace Stegner as "a dead land, though a very rich one." Now, in too many places, it seems much more dead than rich. A large part of the Great Basin lies on the brink of ecological collapse.

Exotic annual grasses and noxious weeds are crowding out native vegetation. The invading species dry out quickly and are highly flammable. They carry wildland fire with devastating effectiveness. They are opportunistic, thriving in disturbed areas, particularly where fires burned. The cycle, once started, is difficult to break: fire follows annual grasses, and annual grasses follow fire.

In late August 1999, a team met to assess the deteriorating ecological condition of the Great Basin. The team's findings were published in a report issued in November 1999, "Out of Ashes, An Opportunity." The recommendation of the team was clear: A restoration effort, like no other in the history of the nation, must be quickly undertaken, to return portions of the Great Basin to a more functioning, thriving natural ecological system. The usual efforts – emergency fire rehabilitation, the weed initiative, and hazardous fuels treatments – were not enough to prevent further rapid deterioration in the Great Basin. Their sum did not equal the whole of what needs to be done.

In November 1999, a second team gathered to discuss and make recommendations regarding how restoration should be conducted. This report is a summary of the team's work.

This report briefly discusses the natural history of the Great Basin and recent changes occurring there. It furnishes a simple definition of restoration and tells why existing practices are not enough to heal the Great Basin. It outlines the main objectives and guidelines for restoration, suggests how restoration might be managed and general principles to guide the process. The report also provides recommended actions concerning four major areas essential to successful restoration: Planning; Inventory and Assessment; Implementation; and Monitoring and Evaluation.

The guiding principles and suggestions are too extensive to cover completely in the Executive Summary, but a few are worth highlighting here. In the "Great Basin Restoration Objectives – What We Hope To Achieve" section is a statement outlining the need to develop a process that will approach resolving problems in the Great Basin from an ecosystem perspective, rather than a programmatic or issue basis. Included in "How It Works – Managing Restoration" is a proposal to appoint a project administrator and a steering board to assist field offices in managing the work. "Guiding Principles" highlight the need for restoration to encompass all landscapes in the Great Basin, not just those burned in 1999. Almost 40 separate actions are suggested in the five areas targeted by the team as essential to restoration success.

This report is not the final word on restoring the Great Basin. It simply outlines the ideas developed by the restoration group in the November meeting, and suggests principles and steps that will help restoration work begin, if sufficient funding is provided in the future. Obtaining the needed funding is the essential next step, so that the work can begin. Without funding, there is little hope that the work needed to reclaim at least part of this isolated, fragile country will ever take place.

The ecological problems of the Great Basin are not new. They've been mounting for decades. When the fires of 1999 struck, a new urgency took hold to address these problems. While wildland fires were the most visible disturbance in the Great Basin, they were a natural response to other activities that had degraded the area since settlement, such as grazing and agricultural practices. Healing the Great Basin must not limit its focus to wildland fire alone, but must also address the causes behind the way humans have changed the landscape. It's a daunting challenge. Those familiar with the problem are convinced that the Great Basin might be facing its last, best chance to restore its rich biological heritage.

The Great Basin is in need of help. Natural processes alone may take centuries to heal the land, its water, and its wildlife. Healing of the Great Basin needs to begin now. Tomorrow may be too late.

Background

The storms blew in from the west and south, some with little or no moisture, yet raining lightning strikes. They rolled across much of the Great Basin like a huge ocean wave, leaving in their wake hundreds of rangeland and forest fires. The summer storms in 1999, most of them concentrated in one five-day period in early August, charred about 1.7 million acres, mostly in northern Nevada.

One veteran firefighter described the scene: "At one point, everywhere we looked, we saw fire, and it was roaring."

As devastating as the wildland fires were, a larger challenge looms. Without quick, decisive action, much of the native grasslands and shrublands burned will be invaded by annual grasses and noxious weeds. The ecological diversity and ability of the land itself to sustain natural resources will be in serious jeopardy. Further, annual grasses–volatile fuels that burn quickly and carry fire faster–mean more fires, more invasions and an acceleration of the entire downward ecological spiral. A study in Oregon found that cheatgrass rangelands are 500 times more likely to burn than a rangeland composed of native vegetation.

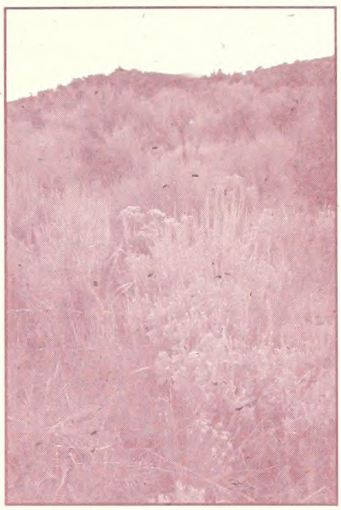
Before the month of August 1999 was over, a group of specialists met in Boise, Idaho, to discuss the Great Basin wildland fires and what their consequences might be. The group's report, "Out of Ashes, An Opportunity," illustrates just what is at stake. Among the conclusions of the report are:

- The Great Basin's ecological resiliency is failing as annual grasses and noxious weeds dominate the landscape.
- Traditional means of fighting invasive species and restoring native habitat are not enough to stop the downward spiral.
- Traditional, post-fire rehabilitation, which mostly addresses soil stability, is not sufficient to resolve the ecological problems associated with wildland fires. A restoration effort, unlike any other attempted on western rangelands, must begin.
- Such a restoration would be expensive, but the cost of doing nothing ultimately will be much higher, as non-native, invasive species dominate more land.
- Close cooperation with key individuals, local governments and agencies, and organizations is essential to successful restoration.

Restoration will not transform the Great Basin to what it looked like 150 years ago. It is an effort to restore some areas of high resource values, reduce impacts to other areas from annual grass and noxious weed invasion, and reverse the destructive cycle of wildland fires and weeds. More than just the resources of the land are at stake; irreplaceable cultural resources must be inventoried and protected. The work will take years and even decades to complete. It will be even more difficult than fighting the flames that raced across Great Basin rangelands last August at more than 40 miles an hour.

The same firefighter who spoke of the roaring fire might have said it best, several weeks after all of the large fires were out. "Of course now," he said, "we have even more work ahead."

A Definition of Restoration



Restoration has different meanings to different people. A definition, slightly refined from what appeared in the earlier publication, "Out of Ashes, An Opportunity," is:

> "Implementation of a set of actions that promotes plant community diversity and structure that allows plant communities to be more resilient to disturbance and invasive species over the long term."

Restoration work will not be limited to areas that burned in 1999. Areas with high resource values that are vulnerable to a takeover by exotic annual grasses or noxious weeds also will be treated. Additionally, areas infested by these invading species, but with a high potential for recovery or high resource values, would be candidates for restoration work.

It is also helpful to mention what restoration is not. Restoration will not rid the Great Basin of cheatgrass and other annual grasses and noxious weeds. It is already too late for that. Nor will restoration return the area to the condition it was in when John C. Fremont coined the phrase "the Great Basin" in the 1840s.

What restoration will do is maintain or reestablish plant communities that are healthy and capable of sustaining wildlife populations, clean water and air, recreation, and traditional multiple uses of the land. It will increase plant communities' resiliency to disturbances such as fire.

A related goal of restoration is to increase the ecosystem stability of the Great Basin. Annual vegetation is highly dependent on climatic variations such as rainfall. That's part of the reason why some years are big fire years and others are not. The implication to land managers is more uncertainty in planning for fire management and grazing allocations. A landscape with healthy perennial vegetation is much more stable for wildlife, fire frequency and intensity, and grazing.

Put another way, restoration will focus on getting the most work done in those areas with the most critical resource values and highest potential for success through a common approach.

Great Basin Restoration Objectives: What We Hope to Achieve

"The West is less a place than a process."

– Wallace Stegner

"Restoring the Great Basin" or phrases similar to it, are used often in this report. What are the objectives of restoration?

•Resolve the problems of the Great Basin from an ecosystem perspective rather than a programmatic or issue basis.

In the past, what could be called restoration work was completed on a fragmented basis, designed mostly to deal with a program (livestock grazing, for example), a single issue (sage grouse) or a crisis (wildland fire rehabilitation) on a site-specific scale. Work was based upon these short-term needs rather than the long-term goal of restoration. The goals of the Great Basin restoration aim to bring all the pieces together in a united effort. Further, such an approach would allow for greater efficiencies as funding and work are coordinated, rather than undertaken on a piecemeal basis.

•Protect healthy, functioning ecosystems consisting of native plant communities; restore degraded landscapes with high potential; and restore decadent shrublands.

These are the basic objectives of restoration on-the-ground. However, restoration work will go only as far as funding allows. A good part of its success is also in the hands of nature; the best science and techniques may be employed in a seeding, for example, but if a drought strikes, the work could suffer setbacks.

•Develop a common basis for an approach to problem identification and resolution.

Identifying problems and developing approaches to resolving them varies from state to state and field office to field office. Successful restoration requires consistent, clear, and efficient approaches to identifying problems and potential resolutions.

•Develop criteria for prioritizing restoration work and funding.
Common criteria for setting restoration priorities would ensure consistency in allocating funds for the work. They would also provide clear guidance to field and resource area offices regarding what restoration work is considered most important. The criteria should be developed in consultation with field representatives.

•Leverage limited current capability by combining funding sources on priority areas identified through the restoration criteria.
Pooled resources will be used in the places with the greatest needs and best chance for success. By combining forces, we can draw increasing support from local communities.

•Capitalize on external partnerships to maximize restoration capability and success.
Interest and support in restoration is widespread. BLM will team up with other federal and state agencies, organizations and individuals willing to complete and fund restoration projects. Combining forces extends everyone's capacity to complete work and meet mutual goals.
This seamless approach will ensure implementation from an ecosystem or landscape perspective.

•Promote scientific research and studies.
Information provided by research is needed to help managers plan and carry out successful restoration of ecosystems. A restoration effort of this magnitude never before has been attempted. It's imperative that the body of knowledge about restoration, including monitoring, keeps pace with the ongoing work.

The objectives of current restoration efforts are critical in determining what the Great Basin will look like in ten, fifty and one-hundred years. Restoration will clearly influence what kind of place the Great Basin will be.

Ecology of the Great Basin

"Yet, real beauty exists here for those who seek it, beauty expressed in colorful spring and fall flowers and more subtly in the wondrous adaptations that enable plants and animals to withstand the extremes so typical of the sagebrush steppe..."

– Ronald J. Taylor, Sagebrush Country

Wedged between the Sierra Nevada mountain range on the west, the Wasatch branch of the Rocky Mountains on the east, and the Snake River country on the north, the Great Basin is about 900 miles long at its longest point and 570 miles wide from east to west. For the purposes of this restoration effort, the Great Basin includes most of Nevada, the western half of Utah, lower third of Idaho, the southeast corner of Oregon and a narrow strip of eastern California. More than 60 percent of this land is federally owned and managed by the BLM.

From mountain ranges that reach 10,000 feet in elevation with steep slopes and jagged cliffs, to sandy plains and dry lake beds, vegetation in the Great Basin changes – sometimes subtly, sometimes overtly – from one drainage or plateau to the next. Within the region, there are three major plant communities: sagebrush, salt desert shrub and pinyon-juniper woodlands. Temperature and moisture dictate where each is found. Salt desert shrub usually grows in low, dry elevations while sagebrush needs more moist surroundings with sandy and slightly alkaline soils. Pinyon-juniper woodlands skirt the flanks of mountains while forests of pine, spruce, fir and aspen blanket the peaks.

Of the three major types of plant communities, sagebrush, consisting of a mix of shrubs, perennial grasses and forbs, is the most common and widespread. Within each of the three plant communities, especially sagebrush, many different types of perennial grasses, wildflowers, forbs and other plants grow. Of these, grasses are the most critical. Bunchgrasses supply a major food source for nearly all herbivorous residents; they prevent or inhibit soil erosion and help stabilize sand dunes; and they provide shelter for small animals. Two of the native grasses that are most well-known are bluebunch wheatgrass, a tall bunchgrass with slender stems; and Indian rice grass, a bunchgrass with a diffusely branched, feathery crown.

Each plant community provides food and cover for an assortment of wild animals and birds. The Great Basin is home to about 100 bird, 70 mammal, and 23 amphibian and reptile species. Some of these include antelope, mountain sheep, mule deer, elk, wild horses, badgers, sage grouse, horned lizards, ground squirrels, sagebrush voles, black-tailed jackrabbits and pygmy rabbits. For centuries, each of these species has successfully adapted to and lived in the Great Basin ecosystem.

In a region that can receive 80 percent of the sunshine possible at its latitude, less than nine inches of precipitation per year, and, when disturbed, takes a very long time to heal, adaptation means the difference between survival and extinction. The plants and wildlife living in the Great Basin are experts.

A land of extreme variations and striking contrasts, some of these adaptations are, as Taylor suggests, wondrous. Consider the sagebrush. This shrub's small leaves are covered with a dense carpet of grayish hairs that help cool the plant by reflecting sunlight and reducing evaporation from drying winds across the surface of the leaf.

Animals living in the Great Basin have also honed unique ways to survive its harsh climate and habitat extremes. For instance, sage grouse and horned lizards hide under a camouflage of sagebrush; ground squirrels and badgers retreat into deep burrows; antelope and black-tailed jackrabbits use their speed and alertness to avoid predators. Many animals restrict their activity to the hours of the day – or night – when temperatures are cooler.

The Great Basin is also home to many sensitive, threatened or endangered plant and animal species. The area is unique, not just because of the number of those imperiled species, but also because so many of those plants and animals are found nowhere else.

Today the Great Basin and its unique character are in imminent danger of being lost forever. Its vast landscape, once known for a habitat rich in diversity and teeming with wildlife, and for supporting a way of life unique and important to the history of the West, has arrived at the portal of a permanent, and potentially devastating, change.

The Changing Face of the Great Basin

"With remarkable variety in combinations of species, the metaphorical sagebrush ocean embraces currents, tides, eddies, and embayments. This is a complex and dynamic sea."

– Stephen Trimble,
"The Sagebrush Ocean"

A picture representative of the Great Basin 150 years ago would probably look much different than the region does today.

In the mid-1850s, the Great Basin, in many places, very much resembled a sea of several types of sagebrush. Settlers, most on their way to California, often wrote of "the sagebrush plain." Explorer John C. Fremont noted Great Basin valleys as places of "... no wood, no water, no grass, the gloomy artemisia the prevailing shrub."

Indeed, sagebrush was the dominant feature, covering more than half of the Great Basin landscape in the mid-1800s. But it was not the only shrub that thrived in this dry country. In the most arid areas, short salt-desert shrubs such as winterfat and shadscale were the dominant overstory vegetation.

Less obvious to the pioneers and explorers was a thriving understory of native bunchgrasses, such as bluebunch wheatgrass and the needlegrasses, all essential components of the ecosystem. Almost unseen, yet vital to the network of plant diversity, was the biological "crust," composed of lichens and mosses that matted the desert floor. The three typical components of the Great Basin shrublands – the sagebrush or salt-desert shrub overstory, the understory of perennial grasses and forbs, and the biological crust – all were critical to a thriving ecosystem. They still are.

Today, the picture is a marked contrast at the lower and middle elevations. Up to 25 million acres in the Great Basin are now dominated by exotic annual grasses. The complex and delicate balance is changing more rapidly than ever in the last 150 years as exotic annual grasses take over more and more of the Great Basin. Differences exist between regions in the Great Basin. Some areas are more susceptible than others to invasive species, further complicating the challenge to managers.

Several factors are behind the changes. Certainly, changes in wildland fire are one cause. Another element is grazing, which began in the Great Basin in the mid-1800s. Interestingly, the two are related.

The Great Basin vegetation is adapted, for the most part, to wildlife grazing. Native Americans in the Great Basin were not agrarian societies, so their disturbance of the land was minimal. But when the Great Basin was settled, livestock grazing increased, and perennial grasses disappeared from many areas, allowing cheatgrass and other annual plants to move in. Biological crusts, which helped shield the Great Basin from invading species, were greatly reduced by livestock, taking away another line of defense. The ecological equation of the Great Basin began to change.

With these changes came more wildland fire. "If you're trying to understand past and present patterns on the landscape, first of all, you need to know something about fire," says one research ecologist. The best assessment is that the Great Basin fire frequency, before settlement, was every 40 to 100 years. Now, wildland fire occurs about every ten years, and in certain areas, even more frequently. The primary cause is the invasion of exotic annual grasses such as cheatgrass, which cure quickly, are highly flammable, and carry fire all too well. Wildland fires are not only more frequent in the Great Basin, they are larger, more intense and definitely more dangerous to fight.

Watersheds often do not fare well following wildland fire, especially after frequently reoccurring fire. When fire clears the vegetation found near streams or ponds, the soils that were once anchored by the elaborate root systems of native plants become vulnerable to wind and water erosion. When these soils are carried into streams or lakes by rain, water quality diminishes, and the risk of flooding increases dramatically. Aquatic life also suffers.

Large, intense fires can be disastrous to sagebrush. Sagebrush relies on seeding to re-establish itself. Before it can regenerate, the opportunistic annual grasses generally have already conquered the habitat. Reoccurring fires then destroy remaining pockets of sagebrush, removing seed sources.

For annual grasses, it's addition by subtraction. Remove the biological crust and native grass understory, then the sagebrush overstory, and the resulting botanic vacuum is made to order for cheatgrass and its cousins. The more annual grasses, the more wildland fire. The more wildland fire, the more annual grasses. Waiting in the wings are noxious weeds, far more damaging to the environment and more difficult to deal with than even the exotic annual grass species. "Fire has gone from maintaining a shrubland, to destroying a shrubland, to ultimately maintaining an exotic grassland," says an ecologist with the U.S. Geological Survey.

At middle and higher elevations, pinyon-juniper woodlands add yet another piece to the complex workings of the Great Basin ecosystem. In the absence of low-intensity wildland fires – due to both removal of native grasses and active fire suppression – pinyon-juniper woodlands are actually expanding. These woodlands consist of water-loving trees that rob moisture from nearby native shrubs and plants, with a predictable result: the native plants disappear and more annual grasses move in. The range of unwanted annual grasses is growing. Researchers formerly believed that annual grasses generally could not thrive much above 5,000 feet in elevation. Now, reports are becoming more common of cheatgrass and medusahead wildrye appearing at elevations of 7,000 feet and higher.

The absence of fire, due to aggressive suppression tactics, has reduced many aspen stands, which need fire to regenerate. Light, understory fire is needed to maintain mature aspen stands, which are some of the most valuable habitats in the Great Basin. Experts say that aspen covers only about 40 percent of the territory it occupied 150 years ago. Advancing pinyon-juniper woodlands also have reduced aspen numbers in some areas.

Although wildland fire is the most noticeable disturbance in the Great Basin, other activities such as grazing, which is widespread, also need to be assessed to determine if they detract from conditions that sustain healthy rangelands. If livestock is shown to contribute to loss of perennial vegetation, then regulations provide a process to modify grazing practices.

It's important to note that not all of the native grasses and shrubs are gone in the Great Basin. There still are areas similar to what they looked like in the mid-1800s, and from an ecological perspective, are functioning well. These functioning parts of the ecosystem are also included as part of the overall restoration plan. Restoration techniques such as establishing fuel breaks, greenstripping, and other methods that protect areas from wildland fire impacts and weed invasions, will help ensure they remain healthy.

But the healthy areas are the exception, not the norm. The Great Basin, through much of the last century, has changed, and continues to change. The social and economic consequences are far-reaching. When natural resources deteriorate, the effects are always felt by humans. In the Great Basin, these effects could be severe in some rural communities. Wildland fires only exacerbate the problem. The downward trend – and some would say the trend is more accurately described as a "spiral" – needs to be reversed before the point of no return is reached.

Why Existing Practices Are Not Enough

"We have here a fragile environment..."

– Samuel G. Houghton,
A Trace of Desert Waters: the Great Basin Story

Public land managers are good at what they do. They know how to treat an area ravaged by fire or flood, battle aggressive annual grasses and noxious weeds, and return fire to an area where it's been excluded and not allowed to function in its natural role.

Unfortunately, these rehabilitation treatments have been applied on a piecemeal basis; they've addressed specific problems on specific sites. And areas in the spotlight are usually not the ones requiring protection or restoration of remaining native vegetation, but the ones in the most severe condition. These efforts resemble triage, and managers do the best they can with limited resources.

But triage alone cannot alter the course of change. The condition of the Great Basin's fragile desert environment has shifted, in places, from a landscape dominated by native shrubs and grasses to a monoculture of annual grasses that bears little resemblance to the once diverse ecosystem. Native shrubs, killed by increasingly frequent wildland fire, cannot recover before invading plant species spread, robbing the soil, and shrubs, of critical moisture and nutrients. And perennial bunchgrasses, once successful at resisting aggressive weeds and annual grasses, have become so weakened by wildland fire and grazing that they can no longer compete with annuals such as cheatgrass, or weeds such as rush skeletonweed.

Although each of the treatments or programs – emergency fire rehabilitation, noxious weeds, and hazardous fuels – are usually effective in dealing with specific problems, they cannot heal the Great Basin as a whole if undertaken separately without long-term commitment, planning and action.

For example, emergency fire rehabilitation usually takes place immediately following a fire. Its purpose is to stabilize soils and reduce risks, such as flooding, to the public. Emergency rehabilitation is not intended, nor designed, to respond to long-term issues, such as restoring native plant communities.

Noxious weed treatment programs attempt to address the invasion of noxious weeds. Funds from this program are used to combat weeds with herbicides, prescribed fire, biological controls or mechanical methods. However, these funds cannot be used to protect healthy plant communities that are susceptible to invasive species. The weed initiative's effectiveness is also limited by the cost of weed treatments and the overwhelming presence of noxious weeds.

The hazardous fuels program provides funding to treat areas where fire has been excluded resulting in degraded vegetation or dangerous fuel levels. Money from this program also allows land managers to use mechanical methods or prescribed fire to stimulate new growth, remove unhealthy vegetation, recycle important soil nutrients, or create fuel breaks to isolate or protect critical native plant communities from cheatgrass invasion.

Each of these treatments is important, and fills a vital role in the overall management of the Great Basin. However, as a research ecologist with the Forest and Rangeland Ecosystem Science Center in Boise, Idaho, said: "We don't have an overarching program that looks at everything in space and time; our tools are only concerned with doing a small portion of one place."

The strategy of the Great Basin restoration is to focus resources on the whole region, not just treat small areas. Anything less may mean a permanent loss of an ecologically diverse ecosystem.

Guiding Principles

Restoration of the Great Basin is not driven by a singular office or program. It must be a multi-resource effort, with wide support both within and outside BLM. BLM field offices, in consultation with interested and affected members of the public, should be the driving force about where restoration takes place, when it takes place, and how it takes place.

Nevertheless, some general principles must be considered as local offices plan the specifics of restoration.

- *Restoration will encompass all landscapes in the Great Basin and not just those areas that burned in 1999.*

  Restoration work must consider entire landscapes to determine whether the emphasis is restoration and/or protection. For example, some areas may continue to thrive if protected by treatments such as greenstripping, or buffering with species that can compete with exotic annual grasses. Other regions may require more intense efforts such as prescribed fire, or mechanical treatments and replanting to start the healing process.

- *Restoration will be consistent with BLM's Standards For Rangeland Health.*

  Each BLM state, in coordination with Resource Advisory Councils, developed standards in the late 1990s that must be met to ensure healthy rangelands. These standards addressed watersheds, water quality, riparian areas and wetlands, native plant communities, threatened and endangered species, grazing and other topics. Restoration activities must produce results that are consistent with each state's Standards for Rangeland Health.

- *Decisions about restoration activities must be made, with involvement of local communities and tribes.*

  Restoration must be driven at the local level, with involvement of local interests. Any other approach limits the chance for restoration success. Restoration work must be coordinated within BLM, and among neighboring landowners and tribes and other agencies, to avoid duplication and ensure consistent approaches. However, all local restoration projects must be considered within a landscape scale to ensure that overall project objectives are being met.

•*Restoration work will be based on the best available science.*
Decisions about restoration activities need to be based on current resource and monitoring information and the best science available. Where specific information is not available, the project may assist or fund priority studies to eliminate the gap in knowledge and technology. A portion of funds will be devoted to the selection and release of native plant materials critical to restoration of biodiversity within the Great Basin. All science or research activities will have a technology transfer and information exchange component to ensure that current "state-of-the-art" restoration practice is shared throughout the region.

•*Restoration must incorporate sound fire management strategies.*
Land use and fire management plans will be modified as needed to incorporate wildland and prescribed fire to reach restoration objectives. This will help prevent large, catastrophic fires, and spread the impacts of fire over time and space to restore a mosaic vegetative pattern of varied fire recoveries or successional stages, rather than fire impacting large areas all at once.

•*Funds will be devoted to on-the-ground work to the extent possible.*
Funds must be channeled to field work, with administrative costs kept to a minimum. All work will be coordinated on local, state or regional levels to ensure consistency of application and incorporation of available science and knowledge.

•*Native species should be given preference in seeding projects, pending seed availability, cost and chance of success.*
It won't be possible to use native species in all seedings, but where practical, they should be given first consideration. In some instances, seed availability or cost will be a factor. In other places, non-native seed may need to be used because of its ability to compete with exotic annual grasses.

•*All restoration projects will include monitoring, data evaluation and information sharing to improve restoration success in the future.*
Monitoring and sharing of information is essential to provide increased success of restoration projects both in the Great Basin and elsewhere. Sharing monitoring data or reports is necessary to accomplish

this goal. All restoration plans need to contain a monitoring strategy outlining responsibilities, techniques used, data interpretation, and information transfer.

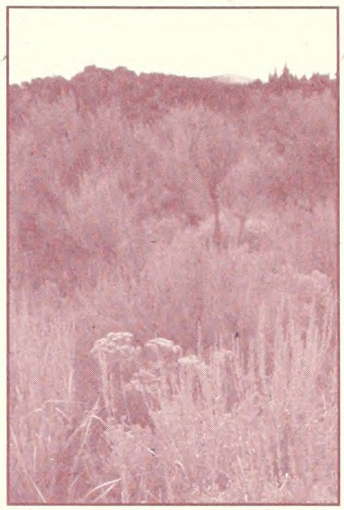
- *Restoration activities must balance ecological needs with social, political and economic considerations.*

Restoration is a biological issue. It is also a social, political and economic issue. All of these views need to be accounted for, to the extent possible, as restoration projects proceed. Not everyone will be completely satisfied with the restoration results. The delicate balance point of where most people are mostly pleased with the outcome will need to be achieved time and time again.

- *The Great Basin must be managed for no net loss of sagebrush habitat and salt desert shrub habitat.*

Loss of complete sagebrush stands or salt desert shrub stands or breaking large stands into small, isolated patches results in habitat fragmentation and the associated decline in native plants and wildlife. It also increases the likelihood of further invasion by cheatgrass and noxious weeds.

How It Works — Managing Restoration



"We're looking at centuries if we rely only on natural processes for recovery."

– Steve Knick, ecologist
U.S. Geological Survey

Restoration of the Great Basin is an idea that enjoys wide support. People familiar with the Great Basin country and the volatile mix of wildland fire, exotic annual grasses and noxious weeds, understand that the time to reverse the devastating cycle is now. Waiting any longer is too much of a risk to take. The changes in the Great Basin may be irreversible, if much more time slips by.

So where does it all begin? How does it work? What is the process for starting restoration of the Great Basin? All are fair questions. This report isn't intended to address every aspect of restoration and pound out every detail. It's a work in progress, and will evolve in concert with our expanding knowledge of the science of restoration and our successes as defined by monitoring.

Here are a few concepts outlined by team members that point restoration work in the right direction.

A PLACE TO START

Where does restoration work begin? What can be done now to prepare for a time when funding becomes available? A program analyst working with the restoration team provided direction. "The year 2000 is the time to figure out a plan of attack," he said. "It's a time to set priorities and be prepared to make a case for funding when it becomes available. Field offices should be willing to invest some of their regular funding into putting together restoration packages."

It is also a time to link potential restoration work with what is already taking place through hazardous fuels operations, the weed initiative, emergency fire rehabilitation, range improvement program, projects funded by various resource management accounts, and money or services provided by partners. That way, current, limited restoration dollars will be leveraged to accomplish the maximum amount of work.

For short-term needs, field offices should use resources that are currently available (hazardous fuels, weeds and emergency fire rehabilitation), plus BLM's annual work plan process, to address the most pressing rehabilitation or restoration needs.

WHO WILL DO RESTORATION WORK?

A premise of restoration is that local BLM managers, working closely with communities, should direct the work. Contracting with private industry is the preferred means of completing on-the-ground projects. Other offices in the agency will provide technical help and assistance as needed.

WHEN A PERMANENT RESTORATION ACCOUNT IS ESTABLISHED, WHAT NEXT?

The restoration effort will need a "project administrator" responsible for overall program guidance and to coordinate restoration efforts among the states. These efforts would include developing criteria for prioritizing restoration work, evaluating state proposals, developing and tracking budgets, transferring technical information, establishing accountability guidelines and working with a Restoration Steering Committee.

The Restoration Steering Committee would be charged with reviewing and evaluating restoration proposals, and providing advice on program priorities, research needs, and transfer of technical information. It would serve as an advocacy group within the agency and elsewhere. It is premature to talk about the composition of the group, but it would require representation of field managers or specialists from each Great Basin state, and outside representatives from academia, local and state government, other federal agencies, and interest groups. The steering committee also would be able to call upon other needed expertise from the public and private sectors for special purposes.

State offices would ensure consistency and coordination of the proposals. They would serve as a link between the field offices and the project administrator. They are also the places where restoration would be coordinated among all BLM programs and priorities, including the weed and fire programs. They would assign preliminary priority to the proposals from field offices. State offices would also see that statewide constituencies, such as conservation groups, livestock organizations, Native American tribes, and other vital groups or individuals are informed of restoration efforts.

Field offices are the heart of the work. They will plan and design restoration projects, ensuring that they are in compliance with the National Environmental Policy Act and other pertinent laws. Supervision of contracted work will be a responsibility of field offices. They will be responsible for monitoring, evaluation, and developing an accountability process. Finally, partnerships and local community involvement will

be among the field offices' responsibilities. Some additional field office positions will likely be needed to implement this program, depending on the magnitude of the local office workload. These may need to be full-time positions, dual-hat positions (combined with weed management, fuel management, etc.), or a shared position among several field offices.

Let's tie this all together by looking at the roles of each office and the process for accomplishing restoration work.

ROLES

- Field offices identify restoration needs and develop proposals, working in conjunction with local interests. At a minimum, the proposals need to be given a name and description; objective; consequences if the proposal is not funded; estimated costs and a funding schedule; positions of key constituents; priority within the field office; and other pertinent information. Proposals should also include staffing, equipment and other needs. The last thing restoration should be to field offices is another number one priority with no accompanying resources to complete the work.

- Proposals will be reviewed by the state office program leader or equivalent for accuracy, completeness and coordination purposes.

- The state office will prioritize field office proposals based upon program criteria and forward the proposal packages to the program administrator, who will work with the Restoration Steering Committee to set overall funding priorities within the Great Basin.

PROCESS

1. Identify areas in need of restoration.
2. Assemble the data using geographic information systems (GIS) information and maps.
3. Set conservation goals for various plant communities.
4. Set restoration priorities based upon factors such as conservation goals, biological values, threats, feasibility of success, and potential leverage from partners.
5. Initiate restoration action.
6. Measure success.
7. Share results.

Finally, one of the chief differences between rehabilitation and restoration is that restoration can treat unburned areas. Restoration work can serve as a pre-emptive strike against exotic annual grasses and noxious weeds. Given the pervasive nature of exotic annual grasses and noxious weeds, a permanent account – if authorized – could be expanded to states beyond the Great Basin, as a supplement to current weed initiative efforts. Montana, Wyoming, Colorado and California all have serious invasive species problems.

Goals and Actions

Planning

GOAL:

Restoration will comply with current land use plans. Restoration activities will be incorporated into new land use plans and revisions of existing plans.

DISCUSSION:

Planning, and specifically meeting BLM's legal requirements for planning, is an important part of restoration. The requirements of planning cannot be ignored. On one hand, restoration is time-sensitive and the "let's get after it" impulse is strong. Conversely, not meeting planning requirements could delay or even doom some of the restoration work. Restoration projects may never begin if they are in conflict with existing land use and other plans. If restoration activities are outside the scope of any existing plans, they likely will trigger an entire new planning and approval process, allowing valuable time to slip away. Fortunately, restoration work fits nicely into existing approved land use plans and the goals of other initiatives such as the Interior Columbia Basin Ecosystem Management Project, Standards for Rangeland Health, the Riparian-Wetland Initiative for the 90s, and others.

There are other reasons why planning cannot be overlooked or treated lightly. Restoration activities must be economically sound and meet land use and other planning requirements to conform with the law. The planning process itself helps to safeguard against activities that may not be in the best overall interest of the environment. Planning involves the public, providing a greater degree of customer service. When properly conducted, planning makes it easier to enlist the services of partners.

In the Great Basin, restoration work cannot grind to a halt. Successful planning is one of the keys to prevent that from occurring.

ACTIONS:

- Restoration activities should be compatible with existing plans, such as Resource Management Plans, Emergency Fire Rehabilitation Plans, Allotment Management Plans, and others.

- Stronger restoration language, including identification of existing areas that require protection and sites in need of on-the-ground treatment, should be incorporated into future land use plans, annual fire plans, plan amendments, and elsewhere as appropriate.

- New plans should address potential restoration activities.

- Field offices should begin reviews of existing land use plans to ensure they comply with restoration activities that could take place in the area covered by the plan. Restoration work needs to be started quickly.

- As information on resource location, condition, threats, past disturbance, etc., becomes available, update land use plans as appropriate.

Inventory and Assessment

GOAL:

Collect and analyze information needed to prioritize and plan restoration treatments. Identify a portfolio of sites where action will be taken.

DISCUSSION:

Some native plant communities persist, and for Great Basin restoration to begin and proceed, it is critical that information on their location and condition is collected and evaluated. Managers also need to know which areas are most degraded or which have the potential for quicker recovery given a little attention. A piece-meal or patchwork approach has been the standard, but has not met the desperate need for a wide-range strategy to restore health to the Great Basin. Assessing the condition of rangelands in the Great Basin will help expand the focus and promote basin-wide recovery.

Initiating restoration on a landscape-scale requires two different levels of information: 1) data from across the Great Basin that will help provide basin-wide perspectives; and 2) localized information that will be used to develop specific treatments and request funding for these projects. Both of these types of data would help field staff learn the condition of existing rangelands, the vegetation potential for these areas and what management or restoration options exist. This information would help in comparing and prioritizing treatments and locations so the maximum benefit is achieved.

ACTIONS:

•Assemble data on: significant past disturbance events including fire; pest outbreaks; cultural resources; current and potential vegetation; soils; topography; threatened and endangered and special status species, including locations and habitat; past treatments and monitoring results; existing land use plans and decisions; land uses; climate, including precipitation, temperature, wind, and humidity data; hydrological and riparian features; administrative boundaries (federal, state, county, tribal, etc.); and digital imagery suitable for detecting features of interest and importance.

•Use GIS technology to collect, organize, analyze and maintain data.

•Once all current information is assembled, it should be synthesized to identify areas needing protection and priority areas for restoration. This would be the initial screen to focus on-the-ground work and dollars. This information will be updated on a continual basis, as additional inventory or monitoring data becomes available.

•Develop a clearinghouse to identify professional and knowledgeable experts, data sources and analytical tools both within and outside the BLM. These may include U.S. Geological Survey, Natural Resource Conservation Service, state and local governments, universities and private vendors.

•Use meetings, conferences and workshops, and internet web sites to share expertise and experience.

•Use predictive models to forecast the potential effects of various management actions on resources. Fire models can project the behavior and cost of fire; vegetation models can relate the likelihood of successful revegetation for combinations of species and site factors, etc. Economic models can put restoration costs and benefits into a framework that will support choosing among restoration alternatives as well as explaining benefits to the public and other constituents. A list of available, potentially useful models should be developed and each one should be assessed for its utility, and cost and applicability to this initiative. Staff may require training on these models.

Implementation

GOAL:

Use existing science and proven, cost-effective techniques to achieve Great Basin restoration objectives.

- Maintain functioning native plant communities where they currently exist.
- Improve plant community composition and structure (e.g. "health") in priority areas that are currently ecologically degraded.
- Protect/restore biological soil crusts.
- Maintain/improve water quality and riparian areas.
- Protect/improve sensitive wildlife habitats.

DISCUSSION:

Despite recent, large catastrophic fires and decades of noxious weed and annual grass invasions, some areas within the Great Basin still resemble the native plant communities of 150 years ago. These areas are important to restoration efforts in the Great Basin because they act as seed sources for native plant reestablishment and reference areas for evaluation, comparison and research.

A much more substantial portion of the Great Basin, however, lies in an unacceptable ecological condition. Shrublands, some of which burned several times during the last 20 or 30 years and received little or no rehabilitation, are now dominated by invading weeds and annual grasses. Other areas may contain unnaturally dense shrub stands that have choked out perennial grasses. Whether they are prime candidates for weedy invaders or have already been overrun by the aggressive exotics, with careful attention – and the help of Mother Nature – many of these sites can still recover.

The value of healthy native plant communities cannot be overstated. They support and maintain wildlife, including threatened and endangered species populations, by providing food and cover. They ensure watersheds function properly by helping the soil absorb and store moisture, which helps reduce flooding, scouring and stream degradation. They resist the negative effects of wildland fire and reduce fire severity. They provide dependable forage for livestock. Lastly, healthy native plant communities offer a stability that resource managers value when planning land management actions. In other words, when managers can count on consistent habitat conditions year after year, grazing use, fire support, and restoration work is much more effective.

Deciding which sites should be targeted for restoration work will depend on many factors. For example, there may be some sites that would respond quickly and economically to management changes alone while more degraded sites may require more expensive, aggressive restoration treatments. The resource values at risk, including species protected under the Endangered Species Act, costs and potential for success are just a few of the criteria that must be applied to any restoration decision. For example, a native shrubland that has converted to annual grassland may become a restoration priority if the site has the potential to provide habitat for wildlife or plant populations in danger of extinction.

The following actions are suggested to help guide decisions for restoration work on Great Basin rangelands.

ACTIONS:

- Use a landscape-scale approach rather than an as-needed, fragmented approach when planning restoration projects.

- Use native plant species in restoration work whenever possible given availability and potential for successful establishment and long-term persistence.

- Use prescribed and wildland fire to create openings in dense or continuous shrub or woodlands to improve woody age class distribution and conditions for herbaceous species in decadent stands. Consider wildlife needs and potential for weed invasion before reintroducing fire onto sites where it has been excluded.

- Apply fuel management techniques (greenstrips, herbicides, etc.) to reduce wildfire entry and adverse impacts to sites susceptible to long-term loss of shrubs or increase in weeds.

- Manage livestock and wild horse herds to maintain or increase native perennial grass/forb cover and reduce disturbance to biological soil crusts. Reduce sagebrush or pinyon/juniper encroachment or density above historical levels and minimize invasions of noxious weeds and exotic annual grasses.

- Alter vegetation composition or patterns where appropriate to achieve a patchwork or mosaic of native plant communities to reestablish a balance between shrub or tree cover and perennial grass and forbs. Treatment can include herbicides, prescribed fire, livestock, and mechanical methods.

•Manage recreation to minimize impacts on native vegetation and the potential for erosion or contaminated water. Encourage use of established sites and minimum-impact recreation ethics, and discourage cross-country vehicle travel. Encourage hikers, mountain bikers, and horseback riders to stay on trails.

•Reduce the potential for noxious weed and exotic annual grass invasions in healthy plant communities by using herbicides, biological agents and mechanical techniques followed by reseeding of native plant species. Facilitate competition with the invasive species by maintaining the vigor of native species through appropriate livestock management and by avoiding large-scale soil disturbances.

•Identify and manage selected native plant communities for seed collection and harvest. Support seed producers by maintaining a consistent demand for native seed.

•Explore the use of native plant species to improve the biodiversity of non-native monocultures such as crested wheatgrass.

•Locate new roads and trails to avoid fragmenting existing sagebrush stands.

•Restore or enhance stream channels and floodplains and improve riparian conditions where unacceptable.

•Use pilot project and demonstration areas to build support for the restoration initiative and test new plant materials or management strategies.

•Use data collected from evaluations of restoration projects to assess progress toward Great Basin restoration objectives, and to develop new or more effective restoration strategies.

•Develop partnerships to enhance landscape-scale management efforts. Use land exchanges, easement purchases, fund transfers and sharing, technology and equipment sharing to enhance, protect and improve Great Basin rangelands.

•Incorporate into restoration planning state Standards for Rangeland Health and Guidelines for Livestock Grazing Management and appropriate goals and recommendations of the Interior Columbia Basin Ecosystem Management Plan for the northern part of the Great Basin.

•Use cost-effective contractors and private sources, when appropriate, to implement projects.

•Coordinate projects with other federal, state and local agencies, private organizations, tribes and the public.

•Develop cooperative education and awareness programs with other agencies, local organizations and government, and tribes to improve public understanding of, and gain support for, restoration projects.

•Inform agency staff of the goals, opportunities, constraints and local benefits of the restoration program. Help employees understand and be prepared to talk to the public about the program.

•Work with academia and other federal and private organizations to plan, implement and monitor projects, including restoration strategies and applications of new technology.

Monitoring and Evaluation

GOAL:

Through monitoring, ensure sufficient data are available to evaluate restoration projects, assess progress toward Great Basin restoration-wide objectives, and develop new or more effective restoration strategies.

DISCUSSION:

Treating a shrubland without monitoring the results is no different from a doctor medicating a patient, but never checking to see if the remedy worked. A rangeland specialist assigned to the Snake River Birds of Prey National Conservation Area in southwest Idaho explained, "We learn through time what works best with good monitoring studies. Monitoring helps us understand whether our actions are effective or not. It tells us if we need to re-treat an area."

Clearly, monitoring must be included in the project planning process. It should incorporate existing data from emergency fire rehabilitation, assessments of rangeland health, allotment resource monitoring studies, etc. It must be consistent across the Great Basin, and the information must be shared throughout the region. Monitoring must be done both in the short-term (one to three years) to determine establishment and recovery, and long-term (10 years and more) to determine persistence and resiliency given drought and management effects. It must consider space and time factors. Areas that have not been treated need to be studied as well to determine failure or success of treatment.

Lastly, monitoring must take advantage of the latest technology (GIS, remote sensing, and video camera production). For example, GIS data helps specialists identify and monitor priority areas, and will help ensure a landscape-scale approach to restoration across the Great Basin.

ACTIONS:

- Coordinate with partners (academia, U.S. Geological Survey, Forest Service, state agencies, etc.) to develop adequate and consistent monitoring protocols through symposia, workshops, literature reviews, and contracts with partners.

- Share monitoring information and evaluations throughout the Great Basin via an interactive website, periodic workshops, an annual report, scientific publications, and presentations at professional society meetings.

- Consider purchase of remote sensing imagery, state-of-the-art data recorders, GPS equipment, digital and video cameras for project monitoring. Hire GIS specialists and other technical expertise needed to get the job done.

- Contract the review of appropriate emergency fire rehabilitation project information (emphasizing where native plants are used or different seeding techniques are applied) to be synthesized into a regional report. Include data on climate and post-rehabilitation management. Consider contracting monitoring.

- Provide long-term Great Basin restoration funding (10 years or more) for restoration project monitoring.

Science

GOAL:

Use appropriate science (integrated studies and applied research) to improve the success of restoration strategies and actions.

DISCUSSION:

The BLM has a lot of experience in rehabilitating rangelands, especially following wildland fire. However, these treatments have been mostly short-term emergency actions geared toward stabilizing the soils, protecting watersheds and replacing forage for livestock and wildlife.

Though emergency rehabilitation can be valuable in the short-term, long-term treatment is the only way the Great Basin can be restored to a sound ecosystem characterized by a variety of native plants and shrubs that support wildlife, livestock and other uses. And the only way to ensure long-term restoration is successful is to base treatments on scientific research and studies.

Unfortunately, Great Basin land managers do not have enough information, or science, on long-term or large-scale restoration techniques, practices and technology. They need more data on the environmental, hydrological and biological factors that affect treatment success. Restoring functional and healthy plant communities and upland watersheds is more complex and not as well understood as commonly used, traditional rehabilitation practices.

Information is needed on how to manage, maintain, and restore biodiversity and functional ecosystems in the Great Basin. Research is also needed to help deal with invasive plants where plant communities have become vulnerable because of natural or human-caused damage. One of the most critical areas where science is needed is in the selection and release of native plants to meet the growing demand for restoring degraded landscapes. Science will also improve public and political credibility, and support the BLM's work.

ACTIONS:

- Identify and develop links with ongoing or planned research projects relevant to the goals of the Great Basin restoration.

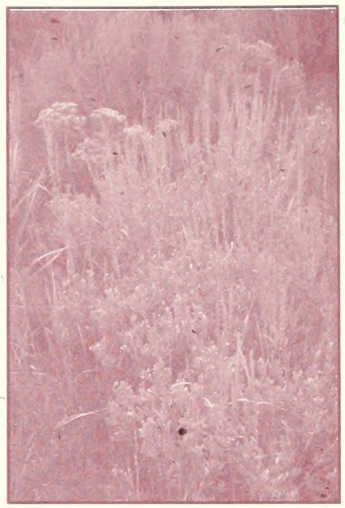
- Provide managers with information on state-of-the-art knowledge in restoration science via literature searches, workshops, conferences, etc.

- Improve knowledge of hydrologic processes on a watershed-scale in pinyon-juniper woodlands.

- Focus science efforts (applied research) on collecting information critical to understanding the effects of disturbances, and methods to manage, maintain, and restore biodiversity and functional ecosystems.

- Form a "Restoration Science Advisory Board" to coordinate and advise the use of science and research to meet the restoration goals of projects. The objectives of this board could include:
    - Develop an action plan to incorporate the best available science in restoration projects.
    - Review, recommend approval, and provide peer reviews for research proposals.
    - Review restoration strategies and project plans for use of available science.
    - Coordinate transfer of information via the Internet, conferences, technical publications, etc.

Conclusions



Much has been covered in this report, yet so much more needs to be said and done. Restoring the Great Basin's health is a daunting challenge. A report of this length, kept general with purpose, cannot possibly explore all the issues that restoration entails.

Yet a few things do seem clear, whether you're a rancher, hunter, biologist, hiker or anyone else who understands this big-shouldered, yet curiously fragile, land.

- The Great Basin's ecological health and resiliency are in jeopardy. Exotic annual grasses and noxious weeds now dominate roughly one-third of the land in the Great Basin and are spreading at an alarming rate.

- The wildland fires of 1999, which burned 1.7 million acres in the Great Basin, called attention to the issue and accelerated the need for restoration work. If the wildland fires heightened awareness of the serious situation in the Great Basin, then it could be argued they left the faintest of silver linings at the black edges of the burned land.

- A restoration effort, on a scale never seen before in this country, needs to be undertaken to stop the downward ecological trends in the Great Basin. The opportunity to do so is brief.

- Restoration funding remains a huge question mark. No permanent account exists for restoration, which means funding may be allocated on an annual, piecemeal basis. That approach restricts the long-term planning and research critical to successful restoration.

- Pending sufficient funding, BLM can accommodate the structure needed to manage restoration with few changes in its current organization.

- The consequences of relying on traditional rehabilitation methods to address the Great Basin's problems are severe in terms of cost, natural resource damage, effects on local economies, wildland fire intensity and occurrence, and public safety.

•Restoration of the Great Basin ecosystem is a monumental challenge, perhaps the single most demanding land-management task faced by BLM. Successful restoration will require the commitment of not only BLM, but also many other agencies, private organizations and other interests.

Too much of the Great Basin already has been altered, in some places, perhaps permanently. Nature may eventually heal the land, but that is not likely to occur in our children's grandchildren's lives, and even at that, there are no guarantees it will happen.

For those who care about the land, it is not acceptable to wait and see. Restoration work must begin now, while there is still time to shape the future of the land.

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